

# Frost monitoring and forecasting using MODIS Land Surface Temperature data and a Numerical Weather Prediction model forecasts for Eastern Africa

NH14A: Satellite Remote Sensing and Management of Natural Disasters II



Ashutosh Limaye, Eric Kabuchanga, Africa Flores, John Mungai,  
Vincent Sakwa, Ayub Shaka, Susan Malaso, and Daniel Irwin





**Goal:** Improve environmental management and resilience to climate change

**Objective:** Strengthen capacity of government decision-makers and other key stakeholders to **integrate earth observation information and geospatial technologies into development decision-making**



# Context

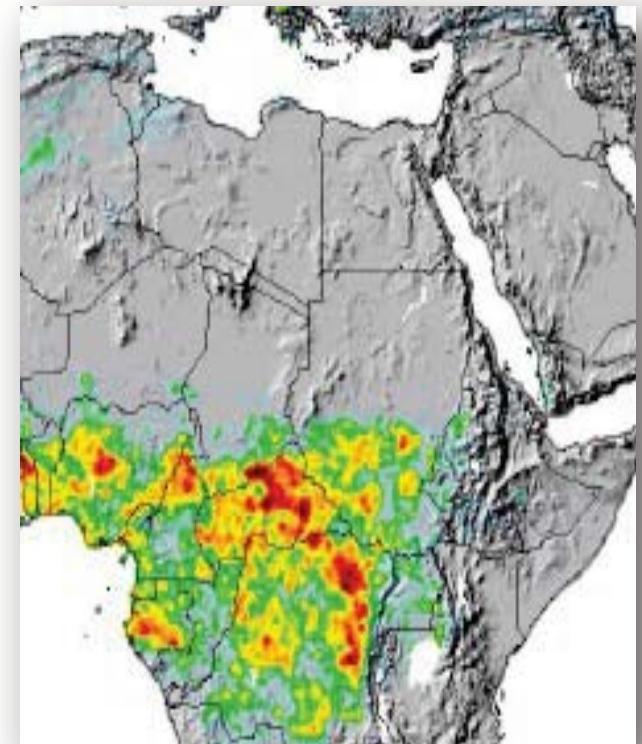


Courtesy: alifayre

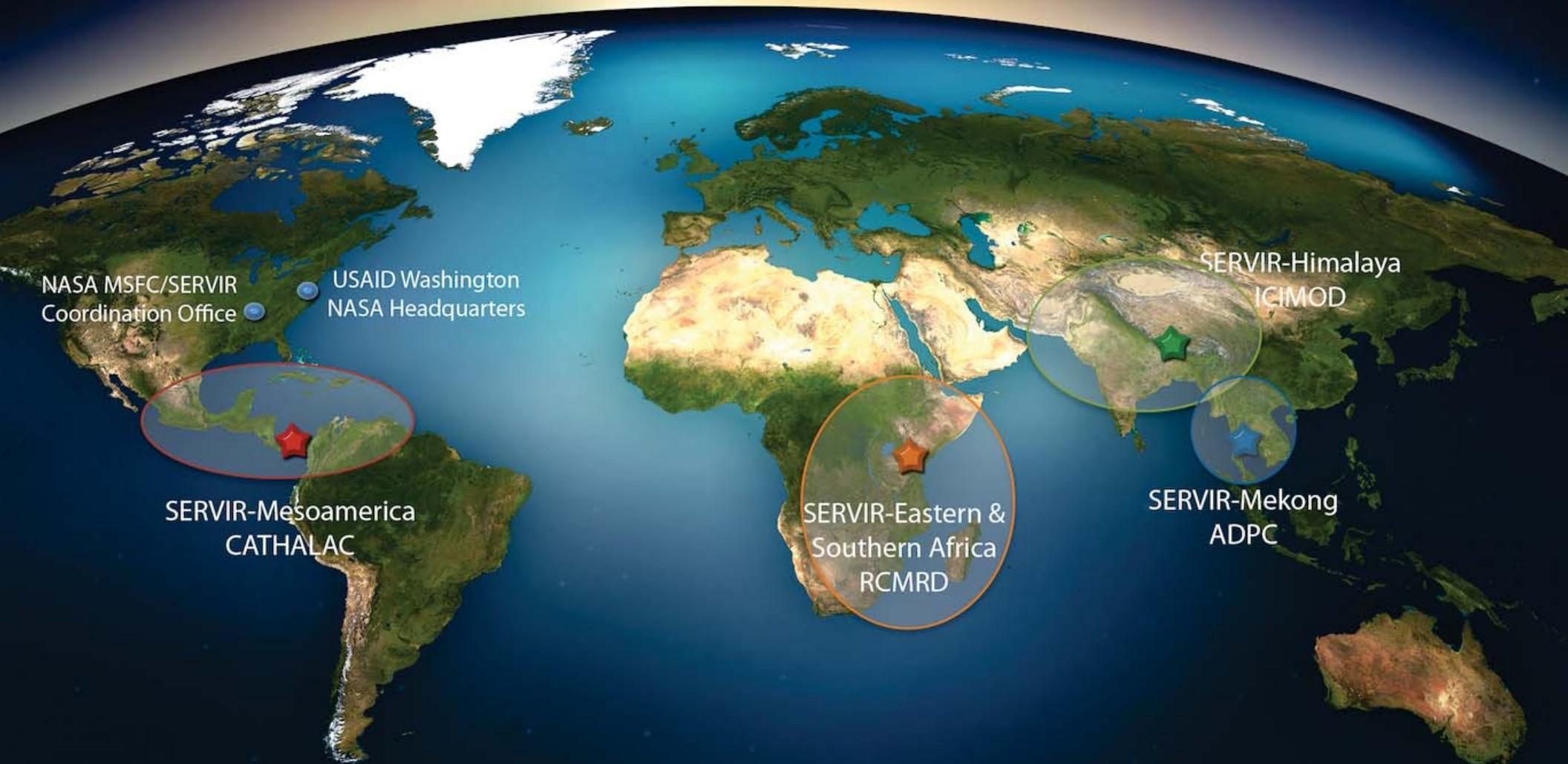
# What We Do



- Identify needs in SERVIR regions
- Link science products from research institutions to meet those needs through improved access to data, models, online maps, and visualizations
- Build capacity of regional institutions, stakeholders, and young professionals
- Strengthen partnerships and foster collaboration across SERVIR network



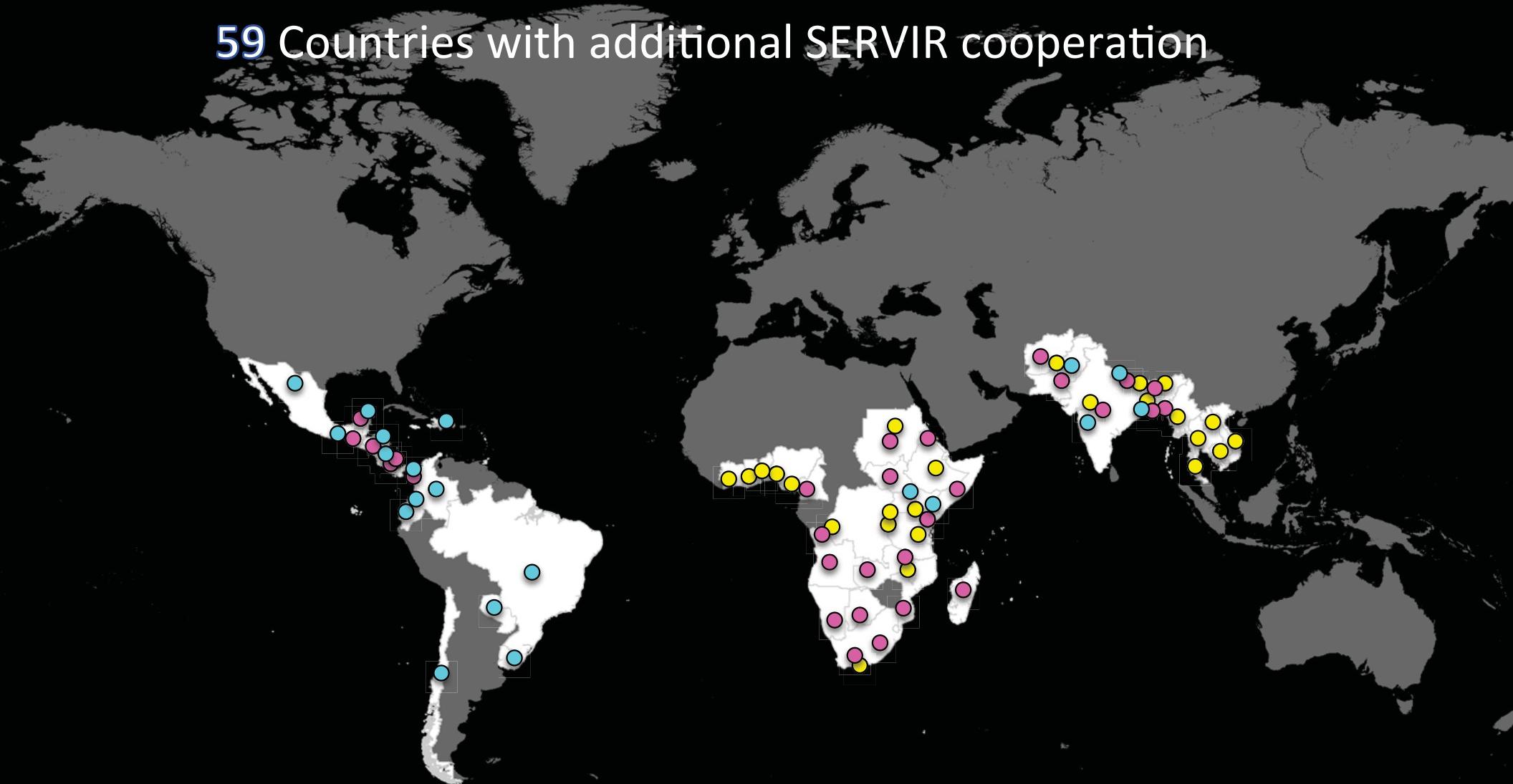
# Regional Partners



# SERVIR Global Geographic Focus



59 Countries with additional SERVIR cooperation



**SERVIR Applied  
Sciences Teams**



**SERVIR /  
MyCOE**



**Disaster Assessment /  
Environmental Analysis**

# SERVIR GLOBAL



Aquarius



OSTM/Jason 2 (NOAA)

Jason



QuikSCAT\*

TRMM

EO-1

Aqua



Terra

Aura



ACRIMSAT

SORCE

GRACE (2)

CALIPSO

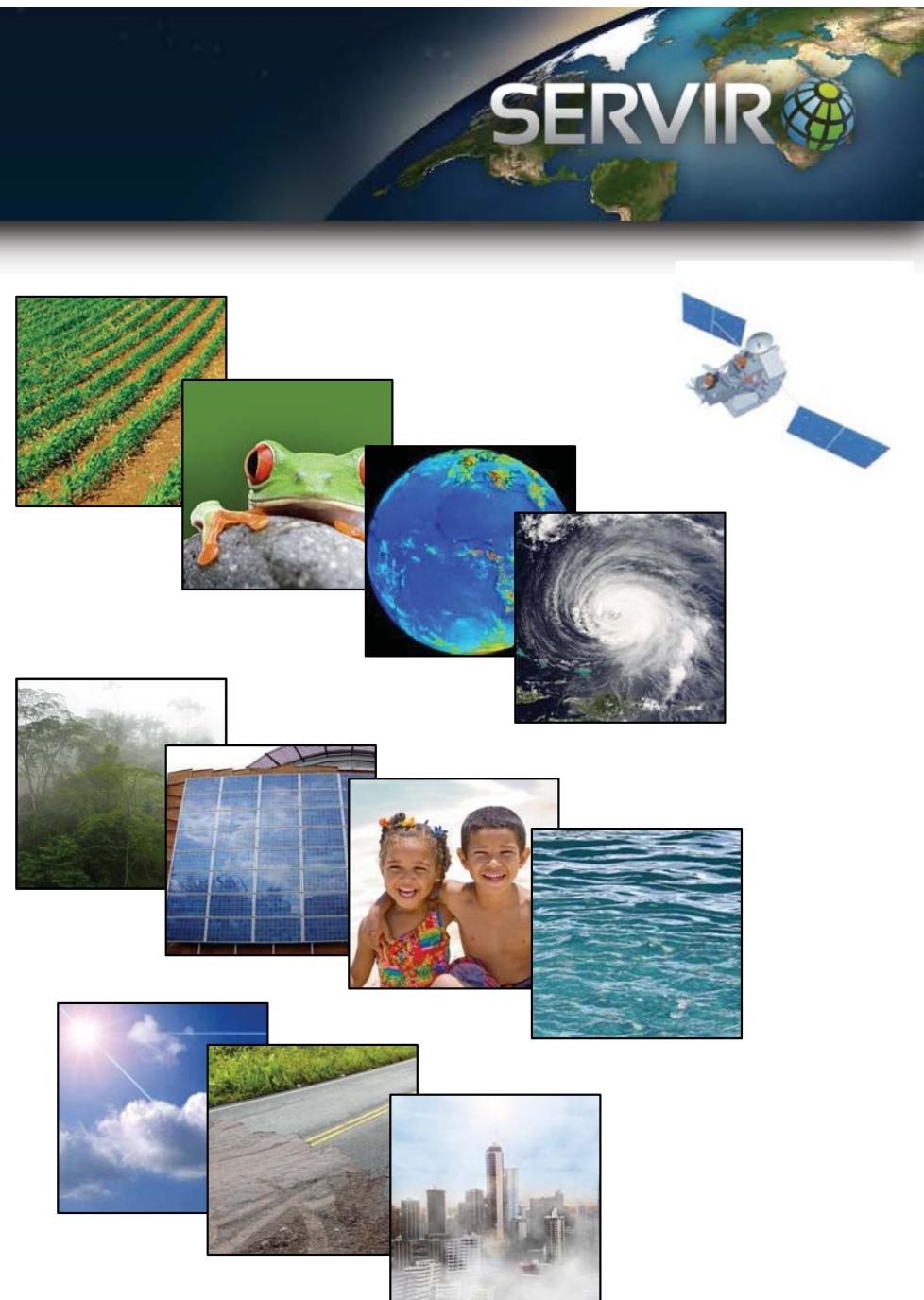
CloudSat

## Connecting Space To Village

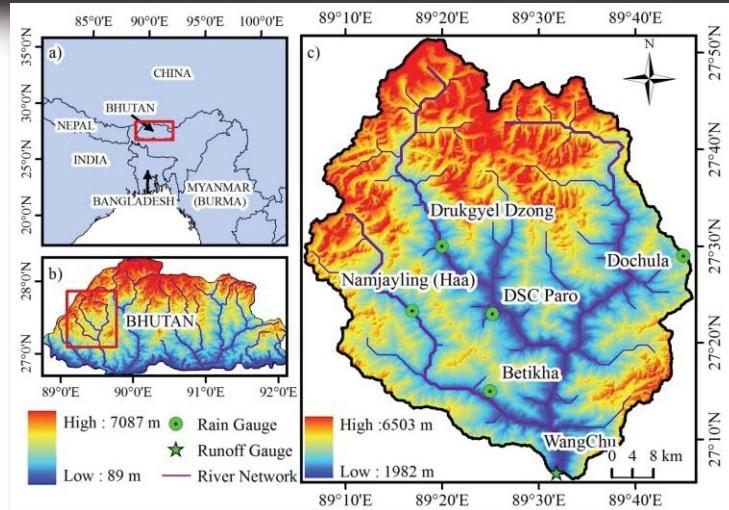


# SERVIR Thematic Areas

- Agriculture
- Biodiversity
- Climate
- Disasters
- Ecosystems
- Energy
- Health
- Water
- Weather



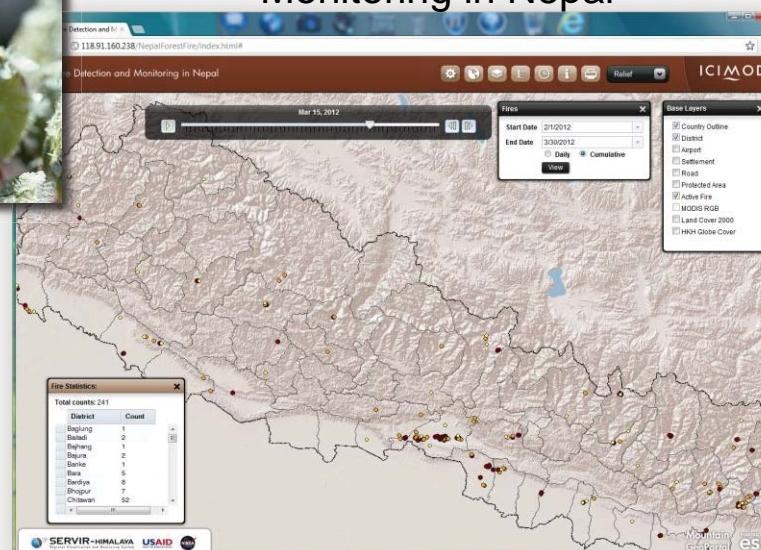
# SERVIR Science Applications for Decision Making



Bhutan Water Resource Assessment

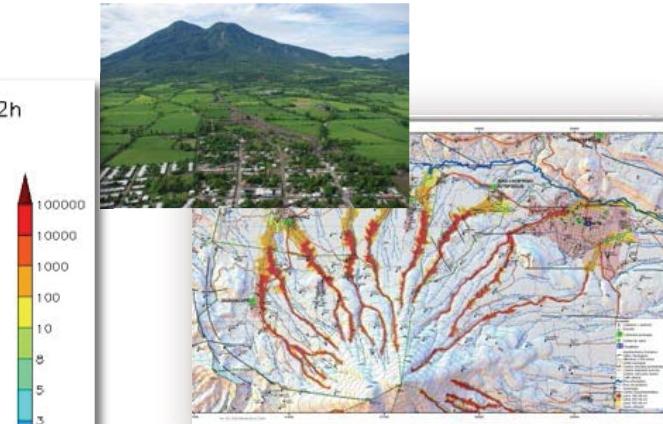
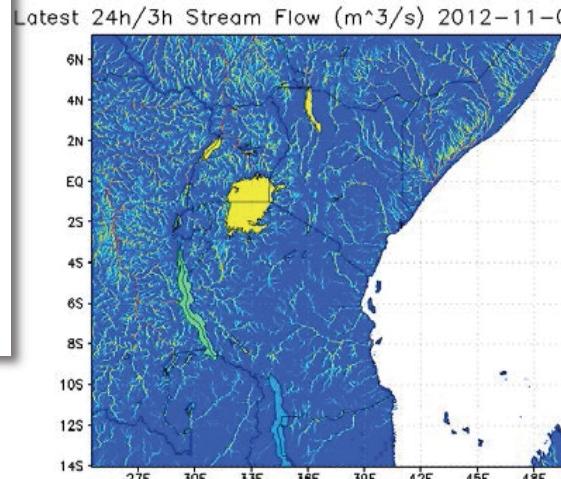


Frost Mapping in Africa

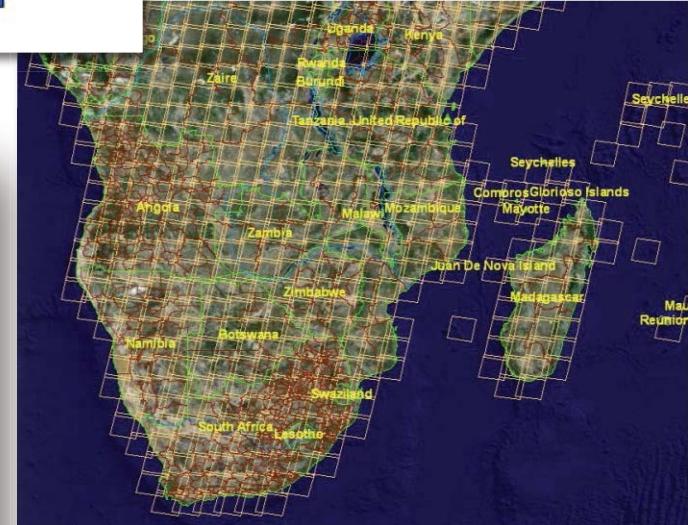


Near Real-time Forest Fire Monitoring in Nepal

## Real Time Streamflow in East Africa



Landslide Prediction System in Mesoamerica



Greenhouse Gas Emissions Inventory in Africa

# Frost Mapping in East Africa



- Tea and coffee are important agricultural commodities in East Africa, providing a living for about 4 million people.
- Many farms have sophisticated operations; many have irrigation systems.
- Frost is a major disaster that causes millions of dollars in damage to tea and coffee crops. Farmers do not have advanced warning of frost.



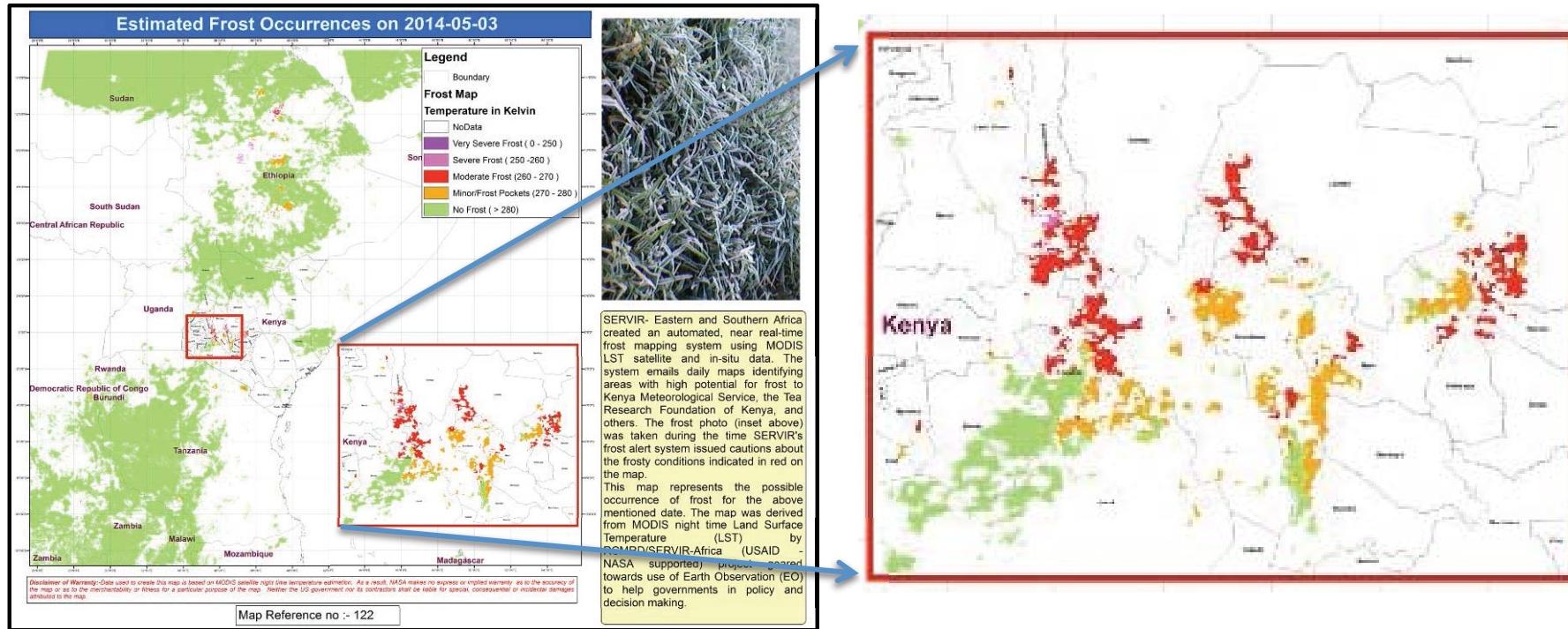
# Automated Frost Mapping using MODIS LST



**SERVIR Tool:** SERVIR created an automated, near real-time frost mapping system using satellite and in-situ data.

The system depended on the NASA LANCE data products. RCMRD has installed a MODIS receiving station, enabling much lower product latency.

The system generates maps identifying areas with high potential for frost, with the thresholds developed with guidance from the Tea Research Foundation of Kenya (TRFK) and Kenya Meteorological Service.



# Uses of Frost Mapping



- With prior warning, farmers can take preventive measures, such as irrigating the farms, to reduce frost damages.
- The system is helping TRFK develop tea cultivation best practices. Tea farmers all over Kenya and beyond depend on TRFK for research improving the quality of tea.
- Insurance giant AON is creating a frost insurance product for this disaster, knowing some quantitative data for the region is available. They plan to use the historical observations as a means to justify claims of crop loss.
- SERVIR-Eastern and Southern Africa is rolling out an early warning system in collaboration with Kenya Meteorological Service by incorporating their operational weather forecasts.



# Product Catalogue



SERVIRcatalog.net / SERVIRcatalogue.net

**SERVIR GLOBAL | PRODUCT CATALOGUE**

Welcome to the SERVIR Global Product Catalogue, a searchable clearinghouse of projects utilizing Earth Observations and NASA Products to help those most in need of tools for climate risk and sustainable forest management.

**NARROW BY:**

- Region
- Theme
  - Adaptation
  - Agriculture
  - Climate
  - Disaster
  - Ecosystems/Biodiversity
  - Health
  - Sustainable Landscapes
  - Water
  - Weather
- Status
- Data Source
- Type

**PRODUCT CATALOGUE**

- Africa B**  
Theme: Climate  
Region: East/Southern Africa
- Agricult**  
in the E  
Theme: Agriculture  
Region: East/Southern Africa
- Clip Zip**  
Theme: Climate  
Region: East/Southern Africa
- CREST F**  
Theme: Climate  
Region: East/Southern Africa
- Bhutan**  
Theme: Climate  
Region: East/Southern Asia
- Eastern**  
Product  
Theme: Climate  
Region: East/Southern Africa
- Environ**  
Dominican  
Theme: Climate  
Region: Central America

**REGIONS ▾**

**SERVIR GLOBAL | PRODUCT CATALOGUE**

Welcome to the SERVIR Global Product Catalogue, a searchable clearinghouse of projects utilizing Earth Observations and NASA Products to help those most in need of tools for climate risk and sustainable forest management.

**SEARCH**

**LIST VIEW** **MAP VIEW**

- Africa Biodiversity Mappi...**  
Theme: Climate, Ecosystems/Biodiversity  
Region: East/Southern Africa
- Agricultural Monitoring t...**  
Theme: Agriculture, Climate  
Region: Himalaya
- Clip Zip and Ship Prototyp...**  
Theme: N/A  
Region: East/Southern Africa
- CREST Hydrologic Modeling...**  
Theme: Adaptation, Agriculture, Climate, Disaster, Water, Weather  
Region: East/Southern Africa, Himalaya
- CREST Streamflow Viewer**  
Theme: Water, Weather, Climate, Disaster, Adaptation, Agriculture  
Region: East/Southern Africa, Himalaya
- Eastern Africa Drought an...**  
Theme: Adaptation, Agriculture, Climate, Water, Weather

For more information on the SERVIR program, visit [www.servirglobal.net](http://www.servirglobal.net)

## **More information:**

SERVIR Global: <http://www.servirglobal.net>

## **SERVIR CO Contacts:**

Daniel Irwin – Project Director

Nancy Searby – NASA HQ Program Manager

Tia Ferguson – Project Manager

Ashutosh Limaye – Project Scientist

Thank you...

Questions?